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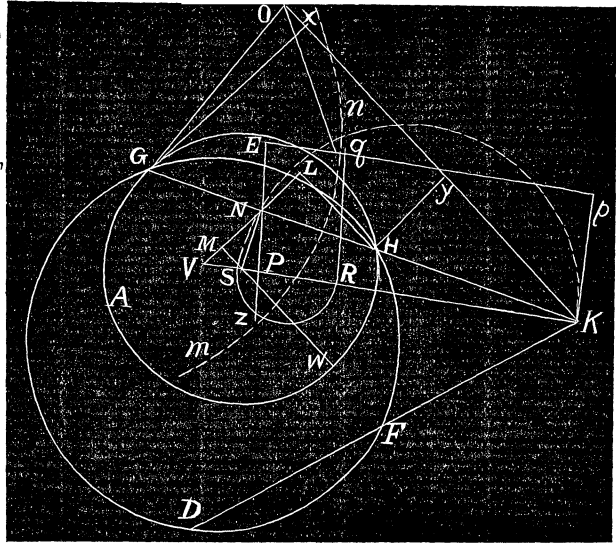
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SOLUTION OF PROBLEM 442. (SEE PAGE 155.)

BY PROF. W. P. CASEY, SAN FRANCISCO, CAL.

Let A be the given circle, D, F and O the given points and $DFHG$ the required circle passing through the given points D, F and intersecting the giv'n circle in the p'ts H, G , so that the triangle GHO may = a given magnitude.

Analysis.—If a circle be described passing through D, F and the center S , of the giv. circle, their common chord will be a



line in position and will pass through the point K , $\therefore K$ is a given point.

Join OK , it is in position; draw Gx, Hy perpendiculars to it. Then as the triangle GHO is given and is $= \frac{1}{2} OK(Gx - Hy)$, $\therefore Gx - Hy$ is given.

Draw SN perpendicular to GH , join SK and draw NP perpendicular to it, draw HL and SW parallel to OK , $\therefore SW$ is in position. Draw NM perpendicular to SW and produce it to meet KS produced in V : then is $NL = \frac{1}{2}(Gx - Hy)$ and is \therefore given, and the triangles NLH, NSM are similar, $\therefore HN : NS :: NL : SM$, and $HN^2 : NS^2 :: NL^2 : SM^2$.

Make $SK \times SR = SH^2$, \therefore as SK and SH are given lines, SR is a given line and R is a given point. Now $SK \times SP = SN^2$, and $SK \times SR = SH^2$; $\therefore SK \times PR = HN^2$, and $HN^2 : NS^2 :: SK \times PR : SK \times SP :: PR : SP$. Hence $NL^2 : SM^2 :: PR : SP$, and as VK, SW are in position, \therefore the $\angle VSM$ is a given \angle , and $\angle SMV$ a right angle; \therefore the triangle VMS has all of its angles given, and therefore the ratio of SM to SV is given, and as $SM^2 : SV^2$ so make $NL^2 : PE^2$. As NL is a given line, $\therefore PE$ is given, and as it is perpendicular to SK , \therefore the line Ep , parallel to SK , is in position. Now $NL^2 : SM^2 :: PE^2 : SV^2$, hence $PR : PS :: PE^2 : SV^2$. Upon SR describe the semicircle SZR , it is given in position; produce EP to

meet it in Z , then $PR : PS :: PZ^2 : PS^2$, hence $PZ^2 : PS^2 :: PE^2 : SV^2$, or $PZ^2 : PE^2 :: PS^2 : SV^2$; $\therefore PZ : PE :: PS : SV$, and by composition we have $PZ : ZE :: PS : PV$, $\therefore PZ^2 : ZE^2 :: PS^2 : PV^2$; but the triangle VNP has all its angles given, being similar to the triangle VMS , hence $VP^2 = m \times PN^2$, $\therefore PZ^2 : ZE^2 :: PS^2 : m \times PN^2$, or $PZ^2 : ZE^2 :: PS^2 : m \times PS \times PK :: PS : m \times PK :: PS \times PR : m \times PR \times PK$, but $PZ^2 = PS \times PR$, $\therefore ZE^2 = m \times PR \times PK$. Draw Rq , Kp perpendiculars to SK and meeting Ep in q and p , \therefore the points p and q are given, and $m \times pE \times Eq = ZE^2$, $\therefore pE \times qE : EZ^2$ in a given ratio of $1 : m$; hence the locus of the point Z is a hyperbola mn in position, and the semicircle is in position, \therefore the point Z is fixed and the perpendicular ZPE is in position, and so is the semicircle SNK ; \therefore the point N is fixed and the line KN is in position, \therefore the points H , G are fixed and the circle $DFGH$ is given in position.

The synthesis of this problem is not long, and will be easily seen from the analysis.

NOTE ON PROBLEM 443.—Prof. Seitz has called our attention to the fact that problem 443 is identical with problem 183, his solution of which was published at pages 27 and 28 of Vol. V.

As the problem had accidentally been placed with the unpublished problems, after its insertion in Vol. V, the fact of its having been published was not remembered when it was inserted in Vol. X, nor when the method of solution, published at p. 156, was sketched.

Prof. Seitz has also pointed out that the equation $V_4 = \frac{1}{12}mx_1$, at page 156, is not exact, because, when the equation is exact, the edges of the pieces V_4 are straight lines, whereas, in this case, they are arcs of a hyperbola. This objection is valid, and the equation should have been written,

$$V_4 = \int_0^{x_1} \varphi(x) dx,$$

where $\varphi(x)$ is the value of m at the altitude x above the lower base of the frustum. But as this method possesses no advantage over that pursued by Prof. Seitz, the reader is referred to the solution of problem 184 at pp. 27-28 of Vol. V for a solution of the problem in detail.

Since the above was put in type we have received from Professor J. M. Greenwood, of Kansas City, Mo., the following letter announcing the death of Professor Seitz, which we take the liberty to publish, as a brief tribute to his virtue and ability, by one who knew him personally.